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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/644,023

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Lujing Cai

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10/31/2006

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EXAMINER

DSOUZA, JOSEPH FRANCIS A

ART UNIT

PAPER NUMBER

2611

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/644,023

Applicant(s)

CAI, LUJING

Examiner

Adolf DSouza

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 3/8/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 – 3, 5, 7 – 8, 11 – 13, 15, 17 - 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Decker et al. (US 4,980,897) in view of Cole (US 5,486,825).

Regarding claim 1, Decker discloses a method of encoding Quadrature Amplitude Modulation (QAM) trellis coded data signals (column 4, lines 45 – 62), comprising:

receiving data bits and inputting into a Trellis encoder (Fig. 4; column 5, lines 47 – 62);

encoding some of the received data bits using a Trellis state machine (Fig. 4; column 5, lines 47 – 62);

employing a 4/5 convolutional encoder to encode the data bits (Fig. 4, element 76 with $k = 4$; column 5, lines 47 – 62);

mapping all of the data bits onto a constellation (Fig. 4, signal mapper 72; column 5, lines 47 – 62);

and forcing the Trellis state machine to return to zero state (column 8, lines 13 – 19; wherein returning to the zero state is returning to the known state).

Art Unit: 2611

Decker does not disclose using a six stage state machine to generate the redundant bit.

In the same field of endeavor, however, Cole discloses generating a redundant data bit using a six stage state machine (Fig. 4a; column 6, lines 24 – 52; wherein the six stages are the six state variables w_1 w_6).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Cole, in the system of Decker because this would allow for the redundant bit to be generated for increasing the coding gain, as is well known in the art.

Regarding claim 2, Decker discloses the Trellis encoder is a 4-D 64 state encoder (Fig. 5D; column 11, lines 31 – 36).

Regarding claim 3, Decker discloses a 2-D QAM constellation is partitioned into an 8 2-D cosets (Fig. 5D; wherein the 8 cosets are the cosets labeled x_0, x_1, \dots, x_7).

Regarding claim 5, Decker discloses the overall mean squared distance between any two neighboring signals is $5d^2_0$ (column 13, lines 5 – 19; wherein the computed according to the formula given and one of ordinary skill in the art can easily apply it to the constellation in Fig. 5D).

Regarding claim 7, Decker does not disclose that the Trellis branch diagram is generated by a six stage finite state machine.

Art Unit: 2611

In the same field of endeavor, however, Cole discloses the Trellis branch diagram is generated by a six stage finite state machine that creates a redundant bit from four input bits (Fig. 4a; column 6, lines 24 – 52; wherein the six stages are the six state variables w_1 w_6).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Cole, in the system of Decker because this would allow for the redundant bit to be generated for increasing the coding gain, as is well known in the art.

Regarding claim 8, Decker discloses forcing of the Trellis state machine to return to zero state is applied at the end of each DMT symbol (column 8, lines 13 – 19; wherein returning to the zero state is returning to the known state).

Claim 11 –13, 15, 17 – 18 are directed to apparatus of the same subject matter claimed in the method/steps claim 1 – 3, 5, 7 – 8, and therefore, are rejected as explained in the rejection of claim 1 – 3, 5, 7 – 8 above.

2. Claims 4, 6, 14, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Decker et al. (US 4,980,897) in view of Cole (US 5,486,825) and further in view of Wei (US 4,713,817).

Regarding claim 4, Decker does not disclose that the cosets are further partitioned into 32 cosets.

Art Unit: 2611

In the same field of endeavor, however, Wei discloses the 2-D cosets are further partitioned into 32 4-D cosets by combining the constellation of two DMT bins (Fig. 13 output).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Wei, in the system of Decker because this would allow for the coding gain to be increased due to increased symbol spacing, as is well known in the art.

Regarding claim 6, Decker does not disclose that the coding gain is 5.63 dB.

In the same field of endeavor, however, Wei discloses the coding gain is 5.63 dB (column 7, lines 52 – 56).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Wei, in the system of Decker because this would allow for the coding gain to be increased due to increased symbol spacing, as is well known in the art.

Claim 14 and 16 are directed to apparatus of the same subject matter claimed in the method/steps claim 4 and 6 respectively and therefore, are rejected as explained in the rejection of claims 4 and 6 above.

3. Claims 9, 10, 19, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Decker et al. (US 4,980,897) in view of Cole (US 5,486,825) and further in view of

Art Unit: 2611

ITU-T G.992.1 (which the Applicant has provided in his Information Disclosure Statement).

Regarding claims 9 and 10, Decker does not disclose that even and odd numbered bits are mapped onto constellation points.

In the same field of endeavor, however, ITU-T G.992.1 discloses even-numbered bits / odd-numbered bits are mapped onto the constellation using 3 bits per bin (page 47 - 50, section 7.8.4).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by ITU-T G.992.1, in the system of Decker because this would allow the mapping to be done so that the coding gain is increased, as is well known in the art.

Claim 19 and 20 are directed to apparatus of the same subject matter claimed in the method/steps claim 9 and 10 respectively and therefore, are rejected as explained in the rejection of claims 9 and 10 above.

Other Prior Art Cited

4. The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure.

The following patents are cited to further show the state of the art with respect to Trellis encoders:

Paik et al. (US 5,233,629) discloses Method and apparatus for communicating digital data using trellis coded QAM.

Betts et al. (US 5,559,835) discloses a method and apparatus for encoding data for transfer over a communication channel.

Okita et al. (US 5,651,032) discloses an apparatus and method for Trellis decoder.

Olafsson (US 5,768,309) discloses a Unified trellis encoder.

Zehavi et al. (US 5,848,102) discloses Method and apparatus for encoding/decoding QAM trellis coded data.

Contact Information

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adolf DSouza whose telephone number is 571-272-1043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone

Art Unit: 2611


number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



AD

Adolf DSouza
Examiner
Art Unit 2611



MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER